decompose; the danger of fire is increased, the burning bridges cause wrecks of trains. In the Arabian deserts the railroad operators suffer comparatively little from disease. On the Transcaspian road the lack of good water brought about disease. On the Iquique road it is necessary to convey water in tanks and in some cases distilled water was carried 40 miles on mules.

In regions of high altitude the rarefaction of the air causes much trouble to the operators, but on the other hand the absence of germs prevents the decay of organic matter. In the report of work on the railroad up the Jungfrau, Dr. Kronecker stated that mountain sickness sets in at altitudes varying with different persons, but that it attacks all persons as soon as they indulge in the least muscular effort above 10,000 feet. Persons in good health can stand being passively transported up to 12,000 feet without inconvenience; a prolonged sojourn may, however, be disastrous. On the Callao, Lima, and Oroya Railroad many thousands of laborers lost their lives. "So difficult was it to work in the rarefied air at high altitudes that riveters did not average a week's work each and many returned on the next train." On the other hand, in building the Sierra Leone Railroad the number of deaths and invalids was wonderfully low, but the climate had an enervating effect and there were frequent absences on leave. In the upper portions of the railroads, such as the Jungfrau, snow avalanches are a serious obstacle but may be avoided by burrowing under or by underground tunnels. Many railroads are abandoned during the snow season. Not only in Switzerland but also in the Rocky Mountain region snow sometimes overpowers all human efforts.

In regions of severe winter cold another class of obstacles is met with, namely, the formation of ice. Although deep and frozen rivers and lakes may be traversed by railroads, yet when the breakup comes in springtime there is a period when such transportation must cease and when boats also are impossible. The experiences of the Transsiberian road and the Canadian Pacific are given with some detail. The average number of days during which work is possible on account of the snow and ice and the frozen ground is very limited. At Lake Baikal the soil is unworkable from October to April; at Vladivostock, the number of days when the temperature is below freezing is 150, and, in general, on the Transsiberian railroad the total number of working days in a year is about 100. A general tabulation of the number of working days in each month of the year, for various portions of the United States, would perhaps elucidate many of the problems relating to the labor question.

METEOROLOGICAL EXPEDITION TO THE BAHAMAS.

The Geographical Society of Baltimore, which has been organized and developed through the efforts of Dr. George B. Shattuck and of which Dr. Daniel C. Gilman is President, has organized an expedition for a scientific survey of the Bahama Islands. This expedition will sail on Monday, June 1, from Baltimore for Nassau and other points in the Bahamas. There are about twenty-five scientific members of the party. The vessel, *William H. Van Name*, a schooner of 97 tons, 100 feet long, 26 feet wide, and 9 feet draught, has been chartered, with a special crew, under Capt. C. D. Flowers. The general expenses of the expedition, amounting to about $6000, have been defrayed by contributions from the Geographical Society of Baltimore, the Johns Hopkins University, the Coast and Geodetic Survey, and, especially, the Governor of the Bahamas, Sir Gilbert T. Carter, who will accompany the expedition. A great variety of scientific work is provided for, such as the culture of bacteria, the study of mosquitos and malaria, the observation of marine life at great depths through panes of plate glass inserted in the bottom of a dory. A monument will be established as a bench mark, to which the mean sea level can be referred, and any change in the altitude of this monument above mean sea level will indicate the rising and falling of the earth's crust. A self-registering tide gage will be established at Nassau and be maintained for at least a year by the United States Coast and Geodetic Survey. The Department of Agriculture has allowed the following officials to accompany the expedition, namely, Dr. Oliver L. Fassig, Section Director, United States Weather Bureau, in charge of observations on climatology and physics, and Messrs. C. M. Mooney, J. C. Britton, and E. C. Hughes, who will conduct a soil survey. The National Museum will send Mr. Barton Bean, curator of fishes, who will conduct the work in marine zoology. Dr. Fassig carries several kites for special aerial exploration and will also conduct magnetic observations; he will be assisted by Mr. J. E. Routh. Geology, botany, medicine, and other branches of science are represented by the other members of the party.

Such expeditions as these for geographic exploration and scientific observation give an immense stimulus to the progress of science. Every university profits by encouraging such work. The earth, its atmosphere, and its inhabitants can be properly studied only in proportion as we travel and learn to take a comprehensive view of the whole globe.

MISCELLANEOUS ITEMS.

The Sierra Club of San Francisco has organized an excursion to the summit of Mount Whitney. Prof. Alexander G. McAdie, of the United States Weather Bureau; Prof. Gifford Pinchot, of the Bureau of Forestry, and Dr. G. K. Gilbert, of the United States Geological Survey, will accompany it. It is hoped that Professor McAdie will be able to establish maximum and minimum thermometers on the summit, so that a year hence we may have a record of the extremes of temperatures that have occurred there.

Mr. A. F. Osler, the inventor of the self-recording pressure-plate anemometer, established at many stations in England, died on April 26, near Birmingham, England, at the advanced age of 95. He was a Fellow of the Royal Society of London (1855) and one of the founders of the Royal Meteorological Society (1851).

An international kite competition will be held on the Sussex Downs on June 25.

The Berlin Society for the study of the globe (Gesellschaft für Erdkunde) will celebrate its 75th aniversary on May 4. This society has greatly furthered the progress of meteorology.

When Captain Colbeck discovered the position of the *Discovery*, his own vessel, the *Morning*, was eight miles distant, and a floe of ice prevented any nearer approach. Therefore, coal and provisions were transferred by means of sledges. The *Discovery* is only provisioned until January, 1904, so that a second relief expedition will be necessary.

The *Fram*, under the command of Captain Sverdrup, reached Norway on September 12, 1902, after an absence of four and a quarter years, during most of which time she was locked up in the great Arctic ice fields. The most northerly point attained was 81° 40′ north, in latitude 94° west, and Captain Sverdrup thinks it unlikely that land will be discovered in that region. Meteorological observations were taken every second hour during the four years.

The meteorological report of Mr. George Duthie, for the year ending March 31, 1902, states that he has in operation 7 barometric stations, 3 climatological or thermometric stations, and 9 simple rainfall stations. Of the total number 16 are in Mashona Land and 13 in Matabele Land.

In Nature for May 7, 1903, Mr. William J. S. Lockyer compares the rainfall in several regions of the globe with the variations of the sun spots since 1800, hoping thereby to elucidate the occasional diminution of rain and the consequent droughts. He begins by adopting 5-year means instead of the means of single years, and from these he eliminates the minor irregularities by drawing smoothed or free-hand curves. He finds a long period variation in the rainfall, the greatest rainfall occurring in the years 1815, 1845, 1878–1883, while the rainfall is decidedly deficient in the years 1825–1830, 1860, and 1893–1895. Mr. Lockyer finds indications of a connection between the sun spots and the periodicity of rainfall, such that the minima of sun spots in 1843 and 1878 preceded the maxima of rainfall, he therefore ventures to prolong the curve, and virtually predicts a minimum of sun spots and maximum of rainfall in 1914.

In his annual report for the year ending June 30, 1902, Prof. S. P. Langley describes the work done at his astro-physical observatory in Washington, and which relates mostly to the absorption of the solar rays in the earth's atmosphere as well as in the sun's atmosphere. He says:

> A presumption exists, almost amounting to certainty, that the total radiation of the sun is variable in some relation to the appearance of sun spots, but nothing is yet known to fix definitely the amount of this supposed variability or to measure its effect upon the earth.

WEATHER BUREAU MEN AS INSTRUCTORS.

The course of instruction in meteorology and climatology offered by the Editor to the students of Columbian University, Washington, D. C., has been taken by only one student during each of the past two years. During the college year 1901–2 Mr. R. S. Bassler (the son of Mr. S. S. Bassler, Local Forecast Official at Cincinnati) pursued a course on meteorological instruments, embracing the Editor's Treatise on Meteorological Apparatus and Methods and some other more recent works. During the college year 1902–3 Mr. Alvin P. Burrows, of the Central Office, pursued the course in climatology, which, however, was not given as a course of lectures, but consisted of a study of a manuscript treatise on The Climates of the Globe, by Prof. Alexander Woeikof of the University at St. Petersburg. This treatise was translated from the Russian for the Editor by Prof. A. Ziwet, of the University of Michigan, revised by the author, and is now again in course of further revision in order to adapt it especially to use by American students.

Prof. F. H. Bigelow's course in the Columbian University, in higher meteorology and solar physics, has been taken by Mr. Herber L. L. Solyom, who received his degree of Master of Science (M. S.) from the Columbian University on the completion of the year's work. This course included the mathematical analysis summarized in Bigelow's Eclipse Meteorology and Allied Problems. The thesis submitted by Mr. Solyom related to the present status of research into solar radiation, the solar constant, the radiation function as applied to the earth's atmosphere, and the effect of pressure and temperature upon the solar spectrum.

Mr. S. S. Bassler, Local Forecast Official, Cincinnati, Ohio, delivered an address on May 10, 1902, before the Teachers' Association in Hamilton County, Ohio, on instruction in meteorology in the primary school. Mr. Bassler conducted a course in meteorology at the summer school of the University of Cincinnati from July 5 to September 13, 1901, consisting of ten lectures, embracing the following subjects:

July 5. Introduction; explanation of instruments, charting temperatures, and drawing isotherms.

July 12. Temperature; chapter 2 of Waldo's Elementary Meteorology, charting pressure, and drawing isobars.

July 19. Pressure and wind; Waldo's Elementary Meteorology, chapters 3 and 4; charting isotherms and isobars together.

July 26. Moisture; Waldo's Meteorology, chapters 5 and 6; preparation of a complete weather map.

August 2. Written examination and review.

August 16. primary circulation of the atmosphere (Waldo, chapter 8).

August 23. Secondary circulation of the atmosphere (Waldo, chapter 9).

August 30. Miscellaneous phenomena (Waldo, chapter 10).

September 6. The weather and the weather map (Waldo, chapter 11).

September 13. General review of the whole subject, with lantern slides.

During the subsequent school year, 1902–3, Mr. Bassler sent to every school in Cincinnati the daily weather map and special notices of all weather changes for the benefit of the scholars and their families. Fifty-six schools and colleges and 60,000 pupils entered into this arrangement.

Mr. J. W. Bauer, Section Director, Columbia, S. C., reports that on November 12 he lectured to the public school pupils and patrons at Laurens, S. C., on the history and the work of the Weather Bureau.

Mr. E. A. Beals, Forecast Official, Portland, Oreg., reports the visit of the high school class in physical geography to the office of the Weather Bureau on October, 16, 1902.

Mr. A. H. Bell, Observer, Eureka, Cal., reports a lecture on April 20, 1903, before the Eureka Club, on the uses of meteorology; very great interest was shown in the subject and a movement was made toward a permanent meteorological outfit for educational purposes.

Mr. W. T. Blythe, Section Director, Indianapolis, Ind., reports a lecture on forecasting before the junior class of the Indiana Medical College. The Secretary of the Horticultural and Agricultural Society of Richmond, Ind., Mr. Walter S. Ratliff, advocated the importance of a series of talks of a practical nature, on the relations of the Weather Bureau to the pursuits of man. Commenting on this, Mr. Blythe said:

> There is no longer any doubt in my mind but that the leaders in educational institutions, whether they be in universities, colleges, or farmers' institutes, who persistently decline to avail themselves of and disseminate the meteorological and climatological knowledge gained by the Weather Bureau during the last third of a century, are doing less than their duty to the public.

Mr. Blythe reports that a model Weather Bureau outfit has been established at the Manual Training High School in Indianapolis, and the class of twenty pupils in physiography, under Mr. M. H. Stuart will keep a weather record and study meteorology. It is not the purpose of the course to develop weather prophets but to show the students that the work of the Weather Bureau is a consistent course of reasoning based on scientific principles and not simply guesswork. Mr. Stuart's instruction is broad and excellent.

Mr. Edward H. Bowie, Section Director, Galveston, Tex., reports attending the Farmers' Institute and other agricultural organizations at Austin, Tex., February 12 and 13, 1903.

These lectures were published in full in the Proceedings of the Congress of the State Farmers' Institutes and afforded Mr. Bowie occasion to meet a large number of State officials and prominent agriculturists, and contributed greatly to the intelligent appreciation of the work of the Weather Bureau in that State. Among other things, Mr. Bowie said:

> The Weather Bureau maintains nine regular stations within the State of Texas; we telegraph to forty-one distributing centers the daily fore-